

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SUBJECT: Summaries of the Outdoor Radon and Indoor Radon Progeny Measurements at the Jackpile Open Pit Mine, New Mexico

DATE: SEP 2 . 1978

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DECLASSIFIED

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Enclosed are the data summaries for the outdoor radon and indoor radon progeny measurements which have been completed by ORP-LVF in the vicinity of the Jackpile Open Pit Uranium Mine near Laguna, New Mexico. As per our previous agreement, transmittal to the Governor of the Pueblo of Laguna and any other public information aspects of this data are to be coordinated between EPA, Region VI and the Indian Health Service.

Attachment 1 contains the results of the ambient outdoor radon-222 concentration measurements made during June 1976 at 11 locations in the vicinity of the mine complex. Table 1 is a summary of these results and Figure 1 shows graphically the average radon measurement at each sampling site. Tables 2 through 12 show the individual sample results for each location. While we have not yet performed a statistical analysis of the data, in general, radon concentrations (averaged over the sampling period) in the villages surrounding the mine area are at near background levels. If background radon is subtracted, the average levels in the residential areas (including the Jackpile Mine Housing Area) are less than the applicable State of New Mexico guidelines of 1 pci/l for the general population.

Attachment 2 shows the results of the indoor radon progeny determinations (expressed as working levels) from early December 1975 through July 1976. The average working level (WL) in housing unit #16 at the Anaconda Company housing area (#41784) was 0.0142 WL. The Old Laguna Tribal Building (#41785) had an average of 0.0045 WL-a typical background level.

The Paguate Community Building (#41786) had an average value of 0.0371 WL. This value is in excess of typical background levels and can not be explained at this time. Radiation measurements were made at this location in December, prior to starting sampling. Indoor and outdoor gamma exposure levels were 14.5 and less than 14.0 μ R/hr, respectively. These are typical background gamma radiation levels and do not indicate the presence of an excessive concentration of radium-226, the precursor of radon. Therefore, at the present time, the only explanation for the



apparent elevated indoor working levels at this location appears to be the build-up of radon gas due to normal exhalation from the natural radium content of the dirt floor and adobe block walls and the high equilibrium concentrations of radon progeny due to the lack of ventilation in the room in which the samples are collected. Samples of the dirt floor and adobe wall have been requested so that radiological analysis may be completed to resolve this anomaly.

Outside air particulate sampling will continue through December 1976 at five locations surrounding the mine. Radiological analysis of these air filter samples will take approximately six months. Additional samples (e.g., water, soil, and food material) will also be analyzed for radioactivity content. Track Etch badges will also be collected in December, 1976 and contract analysis will take about three months. Therefore, final report preparation is not anticipated until late 1977 when all sample analyses are completed and the results of the entire sampling scheme can be statistically reviewed and evaluated. Data updates will be transmitted and, of course, any significant results will be immediately brought to the attention of the study participants.

2 Attachments

cc: (w/attachments)
Mr. Donald Beard, IHS
Mr. W. Gray, The Anaconda Company
Mr. Theodore Wolff, NMEIA

TABLE 1. AMBIENT OUTDOOR RADON-222 CONCENTRATIONS (in pCi/l)* DURING JUNE 1976
IN THE VICINITY OF THE JACKPILE OPEN PIT MINE, NEW MEXICO

Location, Description	Maximum Concentration	Minimum Concentration	Average Concentration
Old Laguna-(#1)	1.34 ± 0.18	0.20 ± 0.10	0.51 ± 0.80
Laguna-Training Bldg. (#2)	1.54 ± 0.39	0.14 ± 0.07	0.59 ± 0.88
Laguna Acoma-PHS Hospital	1.61 ± 0.19	0.22 ± 0.11	0.63 ± 0.94
Bibo-Wellhouse	1.40 ± 0.29	Less than 0.12	0.50 ± 0.78
Mesita-Industrial Plant (#1)	0.89 ± 0.33	0.18 ± 0.05	0.47 ± 0.62
Mesita-Community Building (#2)	1.74 ± 0.22	Less than 0.12	0.56 ± 1.20
Moquino-Private Residence	1.44 ± 0.23	Less than 0.12	0.54 ± 1.02
Paguate-Community Building	0.74 ± 0.06	Less than 0.12	0.42 ± 0.46
Jackpile Mine-Company Housing Area	1.84 ± 0.23	0.25 ± 0.10	1.14 ± 1.14
Railroad Trestle (#1) Below Jackpile housing area	2.06 ± 0.26	Less than 0.12	0.98 ± 1.58
(Location #2)-One mile south of Railroad Trestle (#1)	2.72 ± 0.24	0.44 ± 0.05	1.28 ± 1.66

* Source of Analyses: Eberline Instrument Corporation, Albuquerque, New Mexico.

TABLE 2. OLD LAGUNA-(#1)

<u>On</u>	<u>Date/Time</u>	<u>Off</u>	<u>Radon Concentration*</u> <u>± two sigma error term, pCi/l</u>
6/15/76 1500	6/16/76 1340		0.37 ± 0.12
6/16/76 1340	6/18/76 0850		0.23 ± 0.06
6/18/76 0850	6/20/76 0935		0.59 ± 0.16
6/20/76 0935	6/22/76 0855		1.34 ± 0.18
6/22/76 0855	6/24/76 0855		0.26 ± 0.10 (0.049 ± 0.019)**
6/24/76 0855	6/26/76 0855		0.23 ± 0.10
6/26/76 0900	6/28/76 0900		0.20 ± 0.10 (0.090 ± 0.028)**
6/28/76 0900	6/30/76 0930		0.84 ± 0.16
<u>Summary</u>			
6/15/76 to 6/30/76 (8 Samples)			0.20 ± 0.10 to 1.34 ± 0.18 Average = 0.51 ± 0.80

* Eberline Instrument Corp. determination

** EMSL determination

TABLE 3. LAGUNA-TRAINING BUILDING (#2)

On	Date/Time Off	Radon Concentration* ± two sigma error term, pCi/l
6/8/76 1420	6/10/76 1404	1.54 ± 0.39
6/10/76 1406	6/12/76 1218	0.85 ± 0.34
6/12/76 1220	6/14/76 1010	<0.41 (0.090 ± 0.022)**
6/14/76 1011	6/16/76 0935	0.50 ± 0.06
6/16/76 0935	6/18/76 1240	0.14 ± 0.07
6/18/76 1240	6/20/76 1205	0.32 ± 0.10 (0.18 ± 0.033)**
6/20/76 1205	6/22/76 1215	0.18 ± 0.18
6/22/76 1215	6/24/76 1130	0.47 ± 0.13
6/24/76 1130	6/26/76 0830	0.19 ± 0.11
<u>Summary</u>		
6/8/76 to 6/26/76		0.14 ± 0.07 to 1.54 ± 0.39
(9 Samples)		Average = 0.59 ± 0.88

* Eberline Instrument Corp. determination

** EMSL determination

TABLE 4. LAGUNA ACOMA-PHS HOSPITAL

On	Date/Time Off	Radon Concentration* <u>± two sigma error term, pCi/l</u>
6/15/76 1430	6/16/76 1300	0.64 ± 0.14
6/16/76 1400	6/18/76 1220	0.59 ± 0.14
6/18/76 1220	6/20/76 1155	0.24 ± 0.12
6/20/76 1155	6/22/76 1200	1.61 ± 0.19
6/22/76 1200	6/24/76 1115	0.22 ± 0.11
6/26/76 1130	6/28/76 1100	0.44 ± 0.12 (0.071 ± 0.025)**
6/28/76 1100	6/30/76 1010	0.64 ± 0.16
<u>Summary</u>		
<u>6/15/76</u> to <u>6/30/76</u> (7 Samples)		0.22 ± 0.11 to 1.61 ± 0.19 Average = 0.63 ± 0.94

* Eberline Instrument Corp. determination

** EMSL determination

TABLE 5. BIBO-WELLHOUSE

On	Date/Time Off	Radon Concentration* ± two sigma error term, pCi/l
6/8/76 1207	6/10/76 1120	<0.12 (0.041 ± 0.019)**
6/10/76 1120	6/12/76 1130	1.40 ± 0.29
6/12/76 1131	6/14/76 1337	<0.38
6/14/76 1338	6/16/76 1020	1.10 ± 0.14
6/16/76 1021	6/18/76 1140	0.71 ± 0.17
6/18/76 1140	6/20/76 1110	0.50 ± 0.12 (0.18 ± 0.033)**
6/20/76 1110	6/22/76 1120	<0.12
6/22/76 1120	6/24/76 1030	0.32 ± 0.10 (0.065 ± 0.020)**
6/24/76 1030	6/26/76 1100	0.28 ± 0.11
6/26/76 1100	6/27/76 1030	0.28 ± 0.14
6/27/76 1030	6/28/76 1015	0.37 ± 0.10
6/28/76 1015	6/30/76 1130	0.37 ± 0.13
<u>Summary</u> 6/8/76 to 6/30/76 (12 Samples)		<0.12 to 1.40 ± 0.29 Average = 0.50 ± 0.78

* Eberline Instrument Corp. determination

** EMSL determination

TABLE 6. MESITA-INDUSTRIAL PLANT (#1)

On	Date/Time Off	Radon Concentration* ± two sigma error term, pCi/l
6/8/76 1533	6/10/76 1430	0.31 ± 0.06
6/10/76 1430	6/12/76 1415	0.89 ± 0.33
6/12/76 1420	6/14/76 1455	0.49 ± 0.14
6/14/76 1456	6/15/76 1435	0.18 ± 0.05
<u>Summary</u>		
6/8/76 (4 Samples)	6/15/76	0.18 ± 0.05 to 0.89 ± 0.33 Average = 0.47 ± 0.62

* Eberline Instrument Corp. determination

** EMSL determination

TABLE 7. MESITA-COMMUNITY BUILDING (#2)

Date/Time On	Date/Time Off	Radon Concentration* ± two sigma error term, pCi/l
6/15/76 1445	6/16/76 1320	1.74 ± 0.22
6/16/76 1425	6/18/76 1320	0.32 ± 0.12
6/20/76 1225	6/22/76 1235	<0.12
6/22/76 1235	6/24/76 1145	0.34 ± 0.05
6/24/76 1145	6/26/76 1210	0.23 ± 0.08
6/26/76 1210	6/28/76 1120	0.61 ± 0.16
<u>Summary</u>		
<u>(6 Samples)</u>		<0.12 to 1.74 ± 0.22 Average = 0.56 ± 1.20

* Eberline Instrument Corp. determination

** EMSL determination

TABLE 8. MOQUINO-PRIVATE RESIDENCE

On	Date/Time Off	Radon Concentration* ± two sigma error term, pCi/l
6/8/76 1242	6/10/76 1141	1.36 ± 0.14
6/10/76 1145	6/12/76 1151	<0.30
6/12/76 1155	6/14/76 1348	<0.35 (0.090 ± 0.024)**
6/14/76 1350	6/16/76 1037	1.10 ± 0.22
6/16/76 1038	6/18/76 1200	0.24 ± 0.08
6/18/76 1200	6/20/76 1125	0.19 ± 0.12
6/20/76 1125	6/22/76 1140	1.44 ± 0.23
6/22/76 1140	6/24/76 1045	<0.12
6/24/76 1045	6/26/76 1110	0.23 ± 0.10
6/26/76 1110	6/28/76 1030	0.47 ± 0.14
6/28/76 1030	6/30/76 1150	<0.12
<u>Summary</u>		
6/8/76 to 6/30/76 (11 Samples)		<0.12 to 1.44 ± 0.23 Average = 0.54 ± 1.02

* Eberline Instrument Corp. determination

** EMSL determination

TABLE 9. PAGUATE-COMMUNITY BUILDING

On	Date/Time Off	Radon Concentration* ± two sigma error term, pCi/l
6/8/76 1125	6/10/76 1000	0.19 ± 0.13 (0.11 ± 0.010)**
6/10/76 1000	6/12/76 1100	0.57 ± 0.14
6/12/76 1102	6/14/76 1310	0.29 ± 0.11
6/14/76 1311	6/16/76 1055	0.74 ± 0.06
6/16/76 1055	6/18/76 1120	0.18 ± 0.10
6/18/76 1120	6/20/76 1050	0.36 ± 0.10 (0.11 ± 0.026)**
6/21/76 1100	6/22/76 1110	0.65 ± 0.12
6/22/76 1110	6/24/76 1010	<0.12 (0.056 ± 0.020)**
6/24/76 1010	6/26/76 1045	0.31 ± 0.12
6/26/76 1045	6/28/76 1000	0.48 ± 0.12 (0.12 ± 0.029)**
6/28/76 1000	6/30/76 1110	0.73 ± 0.17
<u>Summary</u>		
6/8/76 to 6/30/76 (11 Samples)		<0.12 to 0.74 ± 0.06 Average = 0.42 ± 0.46

* Eberline Instrument Corp. determination

** EMSL determination

TABLE 10. JACKPILE MINE-COMPANY HOUSING AREA

On	Date/Time Off	Radon Concentration* ± two sigma error term, pCi/l
6/8/76 0915	6/10/76 1240	1.83 ± 0.35
6/10/76 1241	6/12/76 1025	1.63 ± 0.36
6/12/76 - 1025	6/14/76 1250	<0.34 (0.31 ± 0.043)**
6/14/76 1251	6/16/76 1200	1.26 ± 0.17
6/16/76 1201	6/18/76 0945	0.53 ± 0.14
6/18/76 0945	6/20/76 1030	0.89 ± 0.18
6/20/76 1030	6/22/76 1050	1.46 ± 0.19
6/22/76 1050	6/24/76 0945	0.25 ± 0.10 (0.20 ± 0.035)**
6/24/76 0945	6/26/76 1030	1.38 ± 0.08
6/26/76 1030	6/28/76 0945	1.84 ± 0.23
6/28/76 0945	6/30/76 1050	1.10 ± 0.07
<u>Summary</u>		
6/8/76 to 6/30/76 (11 Samples)		0.25 ± 0.10 to 1.84 ± 0.23 Average = 1.14 ± 1.14

* Eberline Instrument Corp. determination

** EMSL determination

TABLE 11. RAILROAD TRESTLE-BELOW JACKPILE HOUSING (#1)

Date/Time On	Date/Time Off	Radon Concentration* ± two sigma error term, pCi/l
6/8/76 1025	6/10/76 1304	2.06 ± 0.26
6/10/76 1310	6/12/76 0945	1.61 ± 0.35
6/12/76 0954	6/14/76 1235	<0.12 (0.14 ± 0.029)**
6/14/76 1236	6/16/76 1225	0.29 ± 0.12
6/16/76 1227	6/18/76 0930	0.41 ± 0.13
6/18/76 0930	6/20/76 1010	0.82 ± 0.06 (0.53 ± 0.055)**
6/20/76 1010	6/22/76 0935	1.27 ± 0.22
6/23/76 0935	6/24/76 0930	0.19 ± 0.10
6/24/76 0930	6/26/76 0930	2.05 ± 0.22
<u>Summary</u>		
6/8/76 to 6/26/76 (9 Samples)		<0.12 to 2.06 ± 0.26 Average = 0.98 ± 1.58

* Eberline Instrument Corp. determination

** EMSL determination

TABLE 12. (LOCATION #2)-ONE MILE SOUTH OF RR TRESTLE (#1)

On	Date/Time Off	Radon Concentration* ± two sigma error term, pCi/l
6/8/76 1047	6/10/76 1319	2.57 ± 0.43
6/10/76 1320	6/12/76 1035	1.23 ± 0.29
6/12/76 1038	6/14/76 1035	0.62 ± 0.14
6/14/76 1036	6/16/76 1240	1.55 ± 0.20
6/16/76 1240	6/18/76 0915	0.44 ± 0.05
6/18/76 0915	6/20/76 1000	0.59 ± 0.16
6/20/76 1000	6/22/76 0920	2.03 ± 0.11
6/22/76 0920	6/24/76 0920	0.46 ± 0.13
6/24/76 0920	6/26/76 0940	2.72 ± 0.24
6/26/76 0940	6/28/76 0930	0.84 ± 0.17 (0.84 ± 0.077)**
6/28/76 0930	6/30/76 1040	1.08 ± 0.19
<u>Summary</u>		
6/8/76 to 6/30/76 (11 Samples)		0.44 ± 0.05 to 2.72 ± 0.24 Average = 1.28 ± 1.66

* Eberline Instrument Corp. determination

** EMSL determination

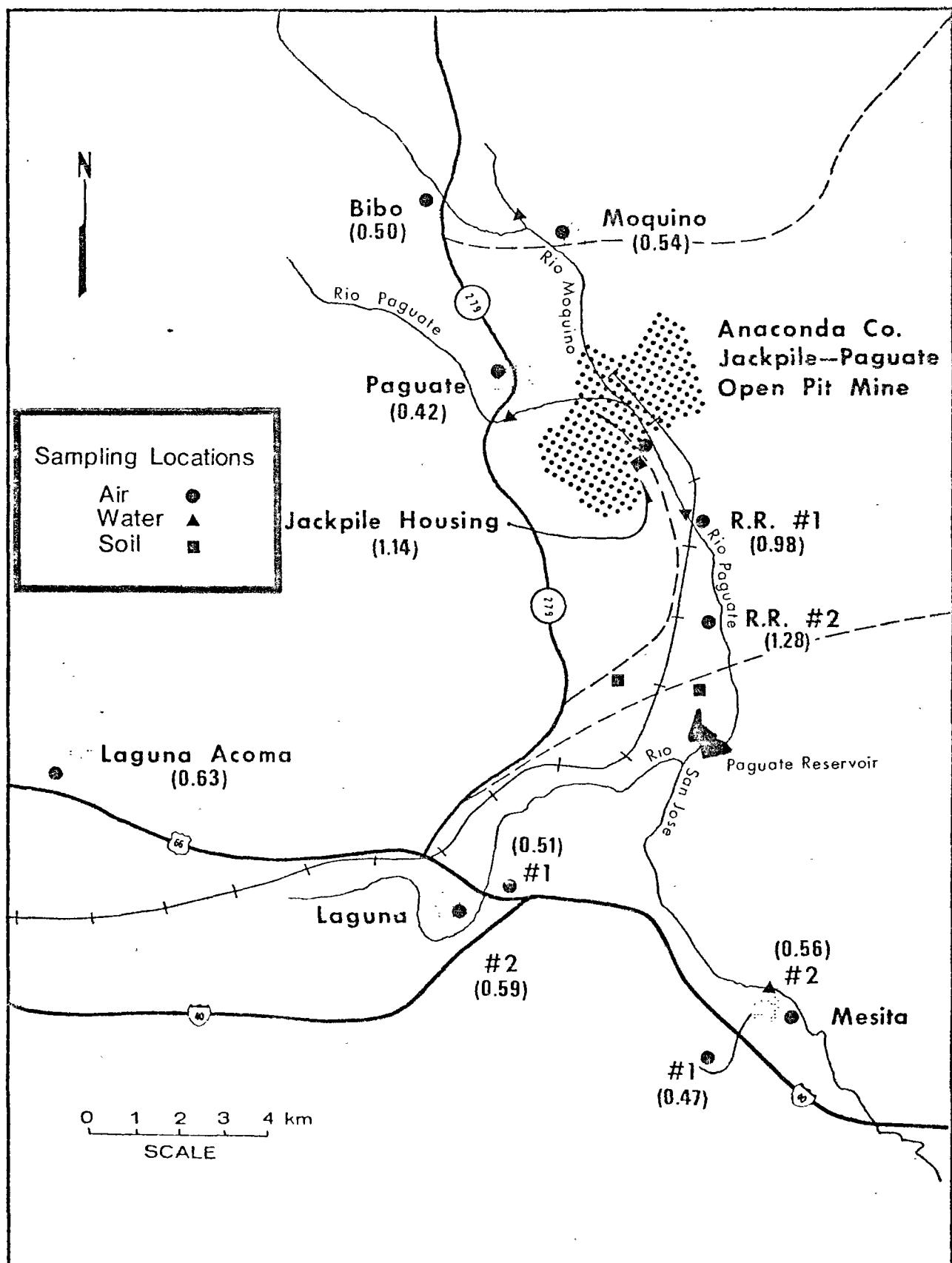


Figure 1. Average ambient outdoor radon (in pCi/l) during June 1976 in the vicinity of the Jackpile open pit mine, New Mexico